NEW PREY RECORDS FOR *PROCTACANTHUS* (DIPTERA: ASILIDAE) WITH COMMENTS ON PREY CHOICE[1, 2]

R. J. Lavigne[3], C. R. Nelson[4], E. T. Schreiber[5]

ABSTRACT: New prey records (n=239) for the following species of *Proctacanthus* in North American collections are listed: *P. coquillettii, P. longus, P. micans, P. nearno, P. nigriventris, P. occidentalis, P. philadelphicus,* and *P. rodecki.* Prey were most often recorded for *P. milbertii* (n=129); these prey represented 7 insect orders and 17 families.

Over the course of several years, miscellaneous records of attacks by asilids of the genus *Proctacanthus* on miscellaneous insects have been observed by the authors and the prey collected. Additionally, in the course of his revision of the genus, Dr. Nelson has made note of insects pinned as prey beneath asilids in the collections he has identified. These records are listed below. Sex of the prey, where noted, follows the scientific name or collecting site; sex of the predator is indicated in parenthesis following the date.

Because of the large number of records encompassed by this accumulation of data, it was felt it would be of little use to list the complete data unless the prey item was identified to genus and/or species. Consequently, data incorporating only Order/Family, State where collected and sex of predator in parenthesis have been included in Table 1. Cumulative data is presented in Tables 2 and 3.

Proctacanthus coquillettii Hine

Hymenoptera: Apidae

Apis mellifera L., California: Imperial Co., Glamis, 4 mi NW, sand hills; IX-3-81 (♀); E.M. Fisher, coll.; Mexico: Baja California, San Quintin, 20 km S, El Socorro Sand Dunes; V-23-88 (♀); E.M. Fisher, coll.

Hymenoptera: Sphecidae

Ammophila sp., California: San Bernardino Co., Kelso, 2 mi S; VI-30-78 (♀); J. Powell, coll.

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[3] Entomology Section, Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, Wyoming 82071
[4] Department of Zoology, The University of Texas at Austin, Austin, TX 78712
[5] John A. Mulrennan, Sr. Research Laboratory, Florida A & M University, 4000 Frankford Ave., Panama City, FL 32405

Proctacanthus longus Wiedemann

Hymenoptera: Apidae

Bombus sp., Florida: Palm Beach Co., SR 441, 2mi N Co. line; V-15-31 (♀); (? coll.)

Proctacanthus micans Schiner

Coleoptera: Hydrophilidae

Sphaeridium scarabaeoides (L.), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-30-81 (2♀ ♀), VIII-2-81 (♀), VIII-6-81 (♂); E. Schreiber, coll.

Diptera: Asilidae

Megaphorus guildianus (Williston), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-26-76 (♀); R. Lavigne, coll.

Ospriocerus abdominalis (Say), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-1-81 (♀); E. Schreiber, coll.

Proctacanthus micans Schiner, Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-31-81 (♂), VIII-2-81 (♂); E. Schreiber, coll.

Scleropogon picticornis Loew, Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-2-81 (♂,♀); E. Schreiber, coll. VIII-04-81 (2♀ ♀); E. Schreiber, coll.

Heteroptera: Lygaeidae

Lygaeus reclivatus (Say), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-2-81 (♀); E. Schreiber, coll.

Heteroptera: Pentatomidae

Codophila remota (Horvath), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-4-81 (♀); E. Schreiber, coll.

Hymenoptera: Anthophoridae

Synhalonia sp., Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-30-81 (♀); E. Schreiber, coll.

Hymenoptera: Halictidae

Agapostemon virescens (Fabricius), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-28-68 (♂); R. Lavigne, coll.

Hymenoptera: Pompilidae

Cryptocheilus terminatum (Say), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-30-81 (♀); E. Schreiber, coll.

Lepidoptera: Lycaenidae

Lycaeides melissa melissa (Edwards), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VIII-2-81 (♂); E. Schreiber, coll.

Lepidoptera: Nymphalidae

Vanessa sp., New Mexico: Lucy; VII-17-32 (♀); C.W. Sabrosky, coll.

Neuroptera: Myrmeleontidae

Hesperoleon nigrilabris (Hagen), Colorado: Weld Co., Nunn, 7 mi N, Pawnee Nat'l Grasslands (IBP site); VII-30-81 (♀); E. Schreiber, coll.

Orthoptera: Acrididae

Arphia pseudonietana (Thomas), Utah: Washington Co., above Zion National Park, Crystal Creek at jct. with Deep Creek; IX-21-82 (♂); C.R. Nelson, coll.

Melanoplus infantilis Scudder, Colorado: Weld Co., Nunn, 7 mi N; VIII-6-81 (♂); E. Schreiber, coll.

Melanoplus sanquinipes (Fabricius), Colorado: Weld Co., Nunn, 7 mi N; VII-31-81 (♀); E. Schreiber, coll.

Trachyrachys kiowa (Thomas), Colorado: Weld Co., Nunn, 7 mi N; VII-31-81 (♀); E. Schreiber, coll.

Trimerotropis gracilis (Thomas), Colorado: Alamosa Co., Great Sand Dunes Nat. Mon., T27S R73W Sec. 15; VII-30-77; F.M. Brown, coll.

Proctacanthus milbertii Macquart

Coleoptera: Scarabaeidae

Aphodius haemorrhoidalis L., Wyoming: Guernsey, 7 mi W; ♂; Frederick Ranch; VIII-20-76 (♀); GSA 1; VII-25-70; R.E. Pfadt, coll.

Euphoria inda (L.), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-22-91 (♂); R.J. Lavigne, coll.

Diptera: Asilidae

Diogmites angustipennis Loew, Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-26-91 (♂); R.J. Lavigne, coll.

Efferia helenae (Bromley), Wyoming: Guernsey, 7 mi W, Frederick Ranch; VIII-4-60; VIII-16-61 (♂), IX-07-64 (♀); R.J. Lavigne, coll.

Efferia sp., Wyoming: Guernsey, 7 mi W, Frederick Ranch; VIII-24-61; R.J. Lavigne, coll.

Megaphorus guildianus (Williston), Wyoming: Platte Co., Wheatland, 37 km N; VIII-16-73 (♂); VII-31-74 (♀); D.S. Dennis, coll.

Guernsey, 7 mi W; VII-29-60 (2♀♀); VIII-4-60 (♂); VIII-12-60 (♀); R.J. Lavigne, coll.

Wyoming: Wheatland, 37 km N; VIII-24-67 (♀); R.J. Lavigne, coll.

Ospriocerus latipennis (Loew), Wyoming: Glendo, 7 mi S; VIII-20-59 (♀); R.J. Lavigne, coll.

Proctacanthus milbertii Macquart, Wyoming: Guernsey, 7 mi W, Frederick Ranch; VIII-11-61; R.J. Lavigne, coll. (prey was ♀, sex of predator ?);

Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-20-91 (♀ took ♂); R.J. Lavigne, coll.

Canada, Manitoba: Bald Hills, Glenboro, 13 mi N; VIII-18-58, J.G. Chillcott, coll. (♀ took ♀)

Scleropogon coyote (Bromley), Wyoming: Glendo, 7 mi S; VIII-12-64 (♂); R.J. Lavigne, coll.

Scleropogon sp., Kansas: 2800'; VII-27-11 (♂,♀); F.X. Williams, coll.

Hemiptera: Alydidae

Alydus sp., nr. pilosulus Herrich-Schaeffer, Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-22-91 (♂); R.J. Lavigne, coll.

Hymenoptera: Anthophoridae

Melissodes sp., Wyoming: Wheatland, T24N R65W Sec 13; VIII-17-74 (♀); R.J. Lavigne, coll.

Hymenoptera: Apidae

Apis mellifera L., Wyoming: Platte Co., Wheatland, 37 km N; worker; VIII-16-64 (♂); R.J. Lavigne, F. Holland, coll.
worker; IX-17-73 (♀); G. Sharafi, coll.
worker; VII-27-74 (5 records); R. Lavigne, coll.
worker; VII-31-74 (4 records); R. Lavigne, coll.
Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", worker; VIII-26-91 (♀); R.J. Lavigne, coll.

Bombus sp., Wyoming: Platte Co., Wheatland, 37 km N; VIII-10-61 (♀, in copula); R.J. Lavigne, coll.
VIII-10-61 (♀); in copula); R.J. Lavigne, coll.
VIII-17-61 (♀); R.J. Lavigne, coll.
VIII-18-61 (♀); R.J. Lavigne, coll.
VIII-23-61 (♀); R.J. Lavigne, coll.
Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", 3 workers; VIII-26-91 (3♀♀, one in copula); R . J . Lavigne, coll.
Canada, Ontario: Simcoe Co., Tiny Twp., Cawaja Beach; VIII-15-68 (♀); J.C.E. Riotte, coll.

Mellisodes obliqua (Say), Kansas: Scott Co., 2970'; (? date) (♀); F.X. Williams, coll.

Hymenoptera: Colletidae

Colletes sp. (3♀♀), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-26-91 (3♀♀); R.J. Lavigne, coll.

Hymenoptera: Halictidae

Halictus sp. (♀), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; VIII-26-91 (♀); R.J. Lavigne, coll.

Hymenoptera: Sphecidae

Ammophila sp., Texas: Brazos Co., College Station; VIII-23-33 (♀); H.J. Reinhard, coll.

Hymenoptera: Tiphiidae

Myzinum quinquecinctum (F.), Wyoming: Platte Co., Guernsey, 7 mi W; VIII-4-60; R.J. Lavigne, coll.; Wheatland; VII-28-74 (♀); D.S. Dennis, coll. Guernsey, "Oregon Trail Ruts"; VIII-20-91 (2♂♂); R.J. Lavigne, coll.

Hymenoptera: Vespidae

Polistes sp., Canada, British Columbia, Oliver; VI-22-22 (♀); P.N. Vroom, coll.
Ohio: Williams Co, Saint Joseph Tp.; IX-1-32 (♀); H. Price, coll.
Washington: Spokane Co., Spokane; VIII-27-31-56 (♀); L.A. Stange, coll.

Pterocheilus quinquefasciatus Say, Wyoming: Platte Co., Wheatland; VII-27-74; R. Lavigne, coll.

Lepidoptera: Noctuidae

Drasteria sp., prob. *howlandi* (Grote), Wyoming: Platte Co., Wheatland, T25N R65W Sec 4; VII-6-74; R.J. Lavigne, coll.

***Lepidoptera:* Nymphalidae**

Junonia coenia (Hubner), Virginia: Chesterfield, Hoods, Richmond; VIII-28-28 (♀); (? coll.)

Vanessa cardui (L.), Kansas: Clark Co., 1950'; VIII-20-11 (?,♀); F.X. Williams, coll.

Lepidoptera: Pieridae

Pontia protodice (Boisduval & LeConte), Colorado: Burlington, S of; VII-27-33; H.G. Rodeck & M.T. James, coll.

Orthoptera: Acrididae

Ageneotettix deorum (Scudder), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts"; 2♂♂, VIII-26-91 (2♂♂); R.J. Lavigne, coll.
♂; VIII-22-91 (♀); R.J. Lavigne, coll.
♀; VIII-22-91 (♂); R.J. Lavigne, coll.
Wyoming: Platte Co.: Wheatland, T25N R65W Sec 4; VII-6-74; R. Lavigne (coll.)

Amphitornus coloradus (Thomas), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", ♀; VIII-20-91 (♀); R.J. Lavigne, coll.
♂; VIII-22-91 (♂); R.J. Lavigne, coll.
♂; VIII-26-91 (♂); R.J. Lavigne, coll.

Aulocara elliotti (Thomas), Wyoming: Platte Co., Guernsey, 7 mi W, Frederick Ranch; VIII-11-61; R.J. Lavigne, coll.; Guernsey, "Oregon Trail Ruts", ♂; VIII-20-91 (♂); R.J. Lavigne, coll.

Melanoplus angustipennis (Dodge), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", 2♂♂; VIII-20-91 (♂,♀); R.J. Lavigne, coll.
2♂♂; VIII-22-91 (2♀ ♀); R.J. Lavigne, coll.
♀; VIII-22-91 (♀, in copula); R.J. Lavigne, coll.
♂; VIII-22-91 (♀, in copula); R.J. Lavigne, coll.
♂; VIII-26-91 (♀); R.J. Lavigne, coll.

Melanoplus femurrubrum (DeGeer), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", 2♂♂; VIII-22-91 (2♂♂); R.J. Lavigne, coll.
♂; VIII-22-91 (♀); R.J. Lavigne, coll.
♀; VIII-22-91 (♂); R.J. Lavigne, coll.

Melanoplus gladstoni Scudder, Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", ♂, nymph; VIII-20-91 (♂, ♀); R.J. Lavigne, coll.
♂, ♀; VIII-22-91 (♂, ♀, in copula); R.J. Lavigne, coll.

Melanoplus occidentalis (Thomas), Wyoming: Platte Co., Guernsey, 7 mi W, Frederick Ranch; VIII-20-76; R.J. Lavigne, coll.
Guernsey, "Oregon Trail Ruts", ♂, ♀; VIII-20-91 (2♂♂); R.J. Lavigne, coll.

Melanoplus sanguinipes (Fabricius), Wyoming: Platte Co., Guernsey, "Oregon Trail Ruts", ♀; VIII-20-91 (♀); R.J. Lavigne, coll.
2♂♂; VIII-22-91 (2♀ ♀); R.J. Lavigne, coll.
♀; VIII-22-91 (♀); R.J. Lavigne, coll.
Wheatland; VIII-18-64. (♀); R. Lavigne (coll.)

Hadrotettix trifasciatus (Say), ♂, Wyoming: Guernsey, "Oregon Trail Ruts"; VIII-22-91 (♀); R.J. Lavigne, coll.

Spharagemon (Trimerotropis) campestris (McNeil), ♂, Wyoming: Guernsey, "Oregon Trail Ruts"; VIII-22-91 (♀, in copula); R.J. Lavigne, coll.

Proctacanthus nearno Martin

Diptera: Apioceridae

Apiocera sp., Nevada: Clark Co., Mesquite; VIII-30-59 (♂); F.D. Parker, coll.

Hymenoptera: Apidae

Apis mellifera L., Arizona: Navajo Co., Leroux Wash, Holbrook, 1 mi N, 5075'; VI-25-66 (♀); Davidsons & M. Cazier, coll.
New Mexico: Hidalgo Co., Post office Canyon; VIII-8-65 (♀); Davidsons & M. Cazier, coll.
Utah: Millard Co., Delta; VII-9-47 (♀), VII-30-49 (♀), VIII-13-64 (♀); G.E. Bohart, coll.
Mexico: Coahuila, across from Langtry; V-18-67 (♀); E.E. Remington, coll.

Proctacanthus nigriventris Macquart

Hymenoptera: Vespidae

Vespula sp., South Carolina: Horry Co., Myrtle Beach; VI-18-82 (♂); F. Genier, coll.

Proctacanthus occidentalis Hine

Diptera: Apioceridae

Apiocera sp., California: Mono Co., Mono Lake, shore, SW corner, 6420'; VIII-18-62 (♀); H.B. Leech, coll.

Diptera: Asilidae

Mallophora fautrix, California: Riverside Co., Riverside; IX-01-35 (♂); Timberlake, coll.

Heteroptera: Alydidae

Alydus sp., California: Contra Costa Co., Antioch; VIII-05-51 (♂); J.C. Hall, coll.
Riverside Co., San Jacinto Mts.; VII-9-30 (♂); E.A. Dodge, coll.

Hymenoptera: Apidae

Apis mellifera L., California: Fresno Co., Kingsburg; VIII-26-52 (♀); (? coll.)
Merced Co., Dos Palos; VII-15-47 (♀); R.E. Beer, coll.
Tuolumne Co., Browns Meadow; VIII-15-60 (♀); A.S. Menke, coll.
Ventura Co., Oxnard; VIII-02-50 (♀); K.G. Whitesell, coll.
Nevada: Humbolt Co., Denio, 1 mi S; VIII-07-72 (♀); D.E. Foster, coll.
Oregon: Jackson Co., Gold Hill; VII-13-30 (♀); H.A. Scullen, coll.
Lake Co., Plush, 15 mi SW; VIII-06-72 (♀); D.E. Foster, coll.
Malheur Co., Adrian, Owyhee River; VII-22-34 (2♀ ♀); D. Martin, coll.
Dixie; VII-08-32 (♂); R.H. Beamer, coll.
Bombus sp., California: Contra Costa Co., Antioch; VIII-20-38 (♂), Sept. 1936; M. Cazier, coll.
Tuolumne Co., Strawberry; VIII-04-60 (♀); R.R. Montanucci, coll.
Washington: Garfield Co., Snake River, Lower Granite Dam, 4 mi NW; VII-26-84 (♂); W.J. Turner, coll.

Hymenoptera: Vespidae

Vespula sp., California: Trinity Co., Mad River, Ruth, 6 mi S (♂); VII-31-60; H.B. Leech, coll.

Lepidoptera: Pieridae

Colias sp., California: Merced Co., Dos Palos; IX-06-49 (♂); J.E. Gillaspy, coll.

Proctacanthus philadelphicus Macquart.

Hymenoptera: Apidae

Apis mellifera L., Massachusetts: Plymouth Co., Carver, sand area near airport; VIII-21-86 (♂); M.A. Valenti, coll.

New Jersey: Burlington Co., Riverton; VIII-24-22 (♀), IX-15-22 (♀); (?, coll)

Proctacanthus rodecki James

Coleoptera: Cicindelidae

Cicindela sp., Kansas: Reno Co., Medora Sand Dunes; VII-3-? (♂); R.H. Painter, coll.

Diptera: Asilidae

Ospriocerus sp., Texas: Donley Co.; VI-26-58 (♀); J.W. Monk, coll.

COMMENTS ON PREY SELECTION

The greatest number of prey records reported in the literature for any species of *Proctacanthus* have been for *P. milbertii.* "*Proctacanthus milbertii* Macquart is a widely distributed large Asilid occurring from Mexico to British Columbia east to Ontario, Ohio, Virginia, and Florida" (Bromley 1949). In that paper, Bromley recorded 659 prey records for *P. milbertii* from the widely diverse states of Iowa, Michigan, Missouri, Ohio, New Mexico and Texas. Based on a revision of the genus, which one of us (CRN) is currently conducting, some of these records are suspect and are not included in this paper, unless specimens were seen by one of the authors. A few additional prey of *P. milbertii* were reported for Texas (Bromley 1934) and for Florida (Bromley 1950). Additional Orthoptera prey were listed for Wyoming (Lavigne and Pfadt 1966), while Joern and Rudd (1982) recorded the impact of this species on grasshoppers.

It should be noted that all ethological and prey information attributed to *Proctacanthus micans* in Guernsey, Wyoming (Dennis and Lavigne 1975) do, in fact, refer to *Proctacanthus milbertii.* All ethological and prey information attributed to *Proctacanthus micans* in Colorado (Rogers and Lavigne 1972) are correct. The prey (n=50) reported in the latter paper represented 7 orders and 17 families.

As suggested by O'Neil and Kemp (1991) "the contents of prey records are not only a function of local insect abundance, but of variation in visibility and catchability among prey species, as well as evolved preferences of robber flies for nutritionally superior or non-toxic insects (Shelly 1984)". O'Neil and Kemp suggested site-specific prey use for *Stenopogon inguinatus* Loew since that species of asilid was observed to concentrate on winged formicid reproductives when locally

available. Certainly this is the case for *Machimus gilvipes* (Hine) which forages in or near the entrances of mammal burrows and appears to specialize on calliphorid flies (85% of diet) (Schreiber & Lavigne 1986).

This also appears to be true in the case of the population of *Proctacanthus milbertii* briefly studied at Guernsey, Wyoming on August 20, 22, & 26, 1991. The asilids ignored a tremendous number of available insects, and while not tested, color appeared to be a dominant consideration. Large numbers of orange & black cantharid beetles were constantly in flight amongst sunflowers (where many asilids congregated), but were ignored even when they flew directly over the asilids. Additionally, no attempt was made to attack orange & black skippers (Hesperiidae), orange and black wasps, such as *Sphex ichneumoneus* (L.), shiny blue-black wasps (Sphecidae), and dragonflies (both red and orange), even though they were in the same size range as commonly taken prey. On the other hand, this population of robber flies apparently showed a predilection (66%, n=47) for brownish grasshoppers, which also were locally abundant. In the case of grasshoppers, the asilids would have had to show great patience awaiting the occasional flight of a grasshopper, as opposed to taking readily available flying insects. Other prey taken were yellow & black striped wasps, i.e. *Myzinum quinquecinctum* (Fabricius) & *Halictus* sp., black, i.e., an unidentified tachinid and black and yellow bumble bee workers. Based on these limited observations, a case could be made for testing the assumption of color preference by using the technique of lure presentation utilized by Lavigne and Holland (1969). It is of interest to note that the population of *P. milbertii* studied at another location near Guernsey, Wyoming by Dennis and Lavigne (1975) also preyed primarily on Hymenoptera (50.6%) and Orthoptera (24.7%).

Of incidental interest, in 1991 five out of 15 mated females were feeding on prey when the pair was collected. This behavior, while fairly uncommon, has previously been reported for four asilid species (Dennis and Lavigne 1975), including *P. milbertii.*

Does the genus *Proctacanthus* specialize on particular orders of insects? A summary of prey records reported herein, broken down by taxonomic order, is given in Table 2. Eight orders of insects were taken as prey with three orders numerically dominating: Hymenoptera, Orthoptera, and Diptera. While our data cannot be used to indicate true preference for particular prey as information regarding relative availability of potential prey at individual sites is lacking, we can note some trends which indicate potential areas for future research. In *P. milbertii,* the species for which the most prey records were available

(Table 3), three orders predominated: Orthoptera (40.3%), Hymenoptera (35.7%), and Diptera (14.7%). These three orders thus made up 91% of the diet of this species, with nearly equally divided specialization between Orthoptera and Hymenoptera. Specialization for Hymenoptera also may be occurring in *P. nearno* where 56% of the records are Hymenoptera; in *P. occidentalis,* 63%; in *P. philadelphicus,* 88%, and in several other less sampled species (Table 3).

However, *P. micans,* another species for which a reasonable number of prey items have been taken, showed a more generalist strategy as evidenced by a more evenly distributed prey scheme (Tables 2 & 3). *P. brevipennis* also seems to be more generalist in food habit.

Overall, 87% of the prey for *Proctacanthus* was of four orders: 38.5% hymenopteran, 26.4% orthopteran, 14.2% dipteran, and 7.5% coleopteran. By partitioning out the relatively well-studied *P. milbertii,* the overall percentage for the four top orders changed to 78% with 41.8%, 10.0%, 13.6%, and 12.7% for the respective orders. Note that the relative importance of the four orders dropped and that the ranking of the orders changed as well (see totals, Table 3), but that these four orders remained on top.

In summary, a certain amount of prey specialization exists in some species of *Proctacanthus,* while others show more generalist trends. Future food niche studies of *Proctacanthus* should address the questions of availability of prey taxa and explore reasons why these prey orders might be preferentially taken. Particular species of *Proctacanthus* which are abundant enough to be used as models in these studies would certainly include *P. brevipennis, P. nearno,* and *P. rodecki.* Feeding behavior studies of *P. rodecki* would be particularly desirable to see if its purported specialization on Orthoptera holds up as larger sample sizes are obtained.

Table 1. List of prey of *Proctacanthus* that were not identified beyond Order and Family.

Proctacanthus brevipennis Wiedemann
- Coleoptera: Scarabaeidae; Kansas (♂), New Jersey (♂)
- Heteroptera: Reduviidae; North Carolina (♀)
- Heteroptera: Pentatomidae; Florida (♀)
- Lepidoptera: Hesperiidae; Florida (♀)
- Odonata: Libellulidae; Florida (♀)
- Orthoptera: Acrididae; Kansas (♀)

Proctacanthus coquillettii Hine
- Diptera: Calliphoridae; California (♂)
- Hymenoptera: Anthophoridae; California (♂)
- Lepidoptera: Noctuidae; California (♀)

Proctacanthus lonqus Wiedemann
Lepidoptera: Hesperiidae; Florida (♀)
Proctacanthus micans Schiner
Coleoptera: Scarabaeidae; Mexico, Durango (2♀♀)
Diptera: Bombyliidae; Arizona (♂)
Heteroptera: Pentatomidae; Arizona (♂)
Hymenoptera: Ichneumonidae; Utah (♀)
Hymenoptera: Sphecidae; Arizona (♂)
Hymenoptera: Tiphiidae; Utah (♂)
Lepidoptera: Lycaenidae; Colorado (♂)
Proctacanthus milbertii Macquart
Coleoptera: Cicindelidae; Indiana (♂)
Homoptera: Cicadidae; Kansas (♀)
Hymenoptera: (?); Anthophoridae; Canada, British Columbia(♂)
Hymenoptera: Apidae; Montana (♂)
Hymenoptera: Ichneumonidae; Michigan (♀); Ohio (♀)
Hymenoptera: Sphecidae; Mississippi (♀)
Hymenoptera: Vespidae; Canada, British Columbia (♂);
Ontario (♀); Michigan (♂, ♀); Texas (♀); Wisconsin ((♀)
Lepidoptera: Pieridae; Colorado (♀)
Lepidoptera: (?); Texas (♂)
Orthoptera: Acrididae; Arizona (♀); Canada, Manitoba (♀);
Colorado (♀, ? Xanthippus); Kansas (♂, ♀); Nebraska (♂);
Ohio (♀); Tennessee (♀); Texas (5♂, 3♀♀); Virginia (♂)
Proctacanthus nearno Martin
Coleoptera: Buprestidae; Utah (♀)
Heteroptera: Pentatomidae; New Mexico (♀)
Hymenoptera: Anthophoridae; Utah (♀)
Hymenoptera: Sphecidae; Utah (♀)
Hymenoptera: Sphecidae: Cercerinae; Arizona (♀)
Lepidoptera: (moth); Arizona (♀)
Lepidoptera: Noctuidae; Utah (♀)
Orthoptera: Acrididae; Utah (♀); Mexico: Sonora (♀)
Proctacanthus nigriventris Macquart
Diptera: Tipulidae; New Jersey (♂)
Proctacanthus occidentalis Hine
Coleoptera: Scarabaeidae; California (♂); Idaho (♂)
Coleoptera: Silphidae; California (♂)
Hymenoptera: Apoidea; California (♂)
Hymenoptera: Ichneumonidae; California (♀)
Hymenoptera: Sphecidae; California (♀)
Lepidoptera: Lycaenidae; California (♀)
Odonata: Coenagrionidae; Washington (♂)
Proctacanthus philadelphicus Macquart
Hymenoptera: Vespidae; Massachusetts (♀); Maryland (♀); New York (♂)
Odonata: Libellulidae; Maine (♀)
Proctacanthus rodecki James
Coleoptera: Scarabaeidae; Oklahoma (♂)
Heteroptera: Coreidae; New Mexico (♂)
Orthoptera: Acrididae; Nebraska (♂); New Mexico (2♀♀) Texas (♀)

Table 2. Records of prey of particular orders pinned with or collected by *Proctacanthus* species in North American insect collections.

species	Odo-nata	Orth-optera	Heter-optera	Lepi-doptera	Cole-optera	Diptera	Hymen-optera	Neur-optera
brevipennis n=8	1	1	2	1	2	0	1	0
coquillettii n=6	0	0	0	1	0	1	4	0
longus n=2	0	0	0	1	0	0	1	0
micans n=34	1	5	3	3	6	9	6	1
milbertii n=129	0	52	2	6	4	19	46	0
nearno n=16	0	2	1	2	1	1	9	0
nigriventris n=2	0	0	0	0	0	1	1	0
occidentalis n=27	1	0	2	2	3	2	17	0
philadelphicus n=8	1	0	0	0	0	0	7	0
rodecki n=7	0	3	1	0	2	1	0	0
totals	4	63	11	16	18	34	92	1

Grand total: 239 records

Table 3. Percentage of use of particular orders of prey taken by *Proctacanthus* species.

species	Odo-nata	Orth-optera	Heter-optera	Lepi-doptera	Cole-optera	Diptera	Hymen-optera	Neur-optera
brevipennis n=8	12.5	12.5	25	12.5	25	0	12.5	0
coquillettii n=6	0	0	0	16.7	0	16.7	66.7	0
longus n=2	0	0	0	50	0	0	50	0
micans n=34	2.9	14.7	8.8	8.8	17.6	26.5	17.6	2.9
milbertii n= 129	0	40.3	1.6	4.7	3.1	14.7	35.7	0
nearno n=16	0	12.5	6.3	12.5	6.3	6.3	56.3	0
nigriventris n=2	0	0	0	0	0	50	50	0
occidentalis n=27	3.7	0	7.4	7.4	11.1	7.4	63	0
philadelphicus n=8	12.5	0	0	0	0	0	87.5	0
rodecki n=7	0	42.9	14.3	0	28.6	14.3	0	0
Genus %, with *P. milbertii*	**1.7**	**26.4**	**4.6**	**6.7**	**7.5**	**1 4.2**	**38.5**	**0.4**
Order ranking with *P. milbertii*	7	2	6	5	4	3	1	8
Genus %, without *P. milbertii*	**3.6**	**1 0**	**8.2**	**9.0**	**12.7**	**1 3.6**	**4 1.8**	**0.9**
Order ranking without *P. milbertii*	7	4	6	5	3	2	1	8

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